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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/752,656	12/29/2000	Beth C. Munoz	00140	9394

7590 05/06/2004

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EXAMINER	
SINES, BRIAN J	

ART UNIT	PAPER NUMBER
1743	13

DATE MAILED: 05/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/752,656	Applicant(s) MUNOZ ET AL.	
	Examiner Brian J. Sines	Art Unit 1743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 May 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

1. Claims 1, 3, 4, 8 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Maley et al. (U.S. Pat. No. 5,770,028 A). Regarding claims 1 and 3, Maley et al. teach an electrochemical sensing apparatus comprising: conductive modified particles, such as electrically-conducting carbon or graphite powder particles, having at least one organic group attached, such as an immobilized enzyme, to the particles (see col. 14, lines 12 – 50). Regarding claims 4 and 9, Maley et al. teach the use of carbon black materials (see col. 15, lines 11 – 21). Maley et al. teach that the carbon particles may comprise a metal substrate layer coating comprising platinum (see col. 14, lines 51 – 64). Regarding claim 8, Maley et al. teach an aggregate comprising a carbon phase (e.g., carbon or graphite particles) and a metal-containing phase (e.g., finely divided platinum group metal either deposited or adsorbed onto the carbon or graphite particles) (see col. 14, lines 12 – 50).

2. Claims 1, 3, 6 and 8 are rejected under 35 U.S.C. 102(e) as being anticipated by Dai et al. (U.S. Pat. No. 6,528,020 B1). Regarding claims 1, 3 and 6, Dai et al. teach a sensing apparatus comprising: conductive modified particles (carbon nanotubes), having at least one

organic group attached, such as an immobilized enzyme, to the particles (see col. 5, lines 32 – 63 & col. 6, lines 1 – 11). Regarding claim 8, Dai et al. teach that the carbon nanotubes may be coated with metal particles (see col. 2, lines 28 – 32).

3. Claims 1, 10 and 12 – 16 are rejected under 35 U.S.C. 102(e) as being anticipated by Snow et al. (U.S. Pat. No. 6,221,673 B1). Snow et al. teach a sensing apparatus comprising: a layer of conductive modified particles, wherein the apparatus is electrically connected to an electrical measuring apparatus, wherein the conductive modified particles comprise conductive particles (conductive metal core 12) having at least one organic group (ligand shell 14 comprising a functionalized organic compound, such as a thiol, amine, or aromatic thiol group) attached to the particles (see col. 2, line 25 – col. 9, line 47; figures 1 – 4).

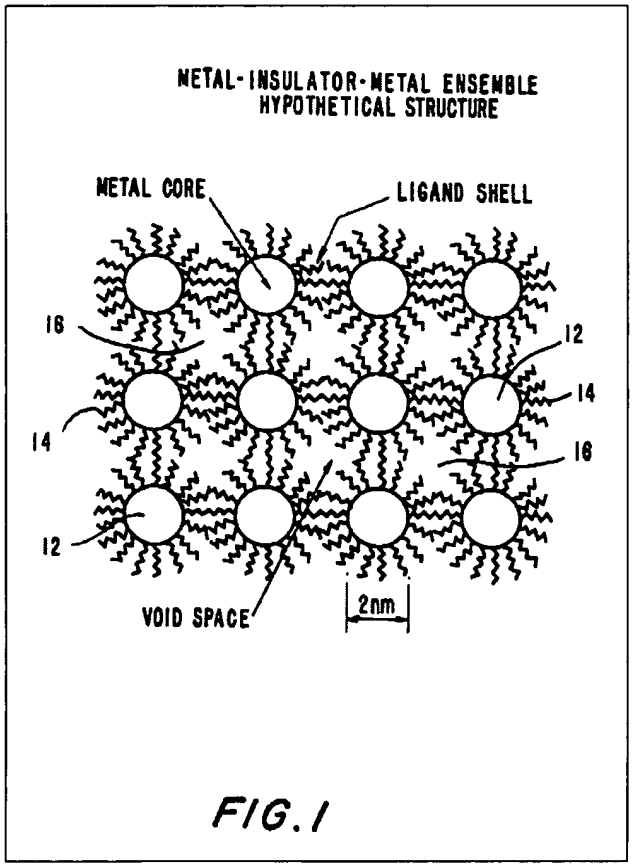
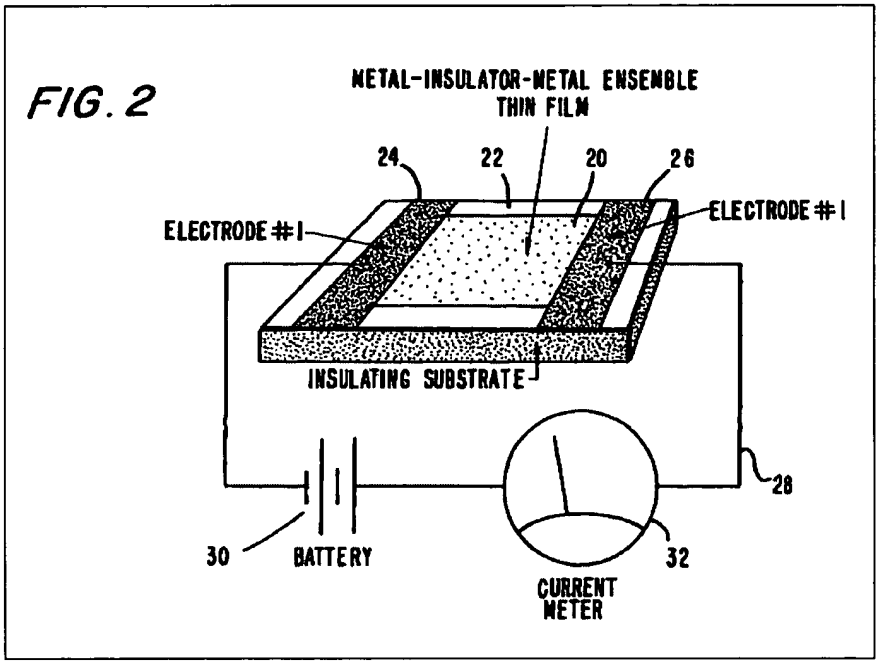


FIG. 1



Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various

claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. Claims 2, 5 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maley et al. Maley et al. do not specifically teach an array of sensors, wherein the array comprises two or more sensors. However, the Courts have held that the mere duplication of parts, without any new or unexpected results, is within the ambit of one of ordinary skill in the art. See *In re Harza*, 124 USPQ 378 (CCPA 1960) (see MPEP § 2144.04). Furthermore, the use of sensing devices incorporating the use of a plurality of sensors arranged in an array configuration are notoriously well known in the art (see MPEP § 2144.03). In addition, the Courts have held that the prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (see MPEP § 2143.02). As a result, a person of ordinary skill in the art would accordingly have had a reasonable expectation of success of incorporating a plurality of sensors within such a sensing apparatus, as taught by Maley et al. Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate an array of sensors within the sensing apparatus, as taught by Maley et al., in order to facilitate, for example, the detection and monitoring of a plurality of different chemical species within an environment. Regarding claims 5 and 11, it is well known in the art that carbon black is a pigment material (see MPEP § 2144.03).

2. Claims 2 and 17 – 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Snow et al. Regarding claim 2, Snow et al. do not specifically teach an array of sensors, wherein the array comprises two or more sensors. However, the Courts have held that the mere duplication of parts, without any new or unexpected results, is within the ambit of one of ordinary skill in the art. See *In re Harza*, 124 USPQ 378 (CCPA 1960) (see MPEP § 2144.04). Furthermore, the use of sensing devices incorporating the use of a plurality of sensors arranged in an array configuration are notoriously well known in the art (see MPEP § 2144.03). In addition, the Courts have held that the prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (see MPEP § 2143.02). As a result, a person of ordinary skill in the art would accordingly have had a reasonable expectation of success of incorporating a plurality of sensors within such a sensing apparatus, as taught by Snow et al. Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate an array of sensors within the sensing apparatus, as taught by Snow et al., in order to facilitate, for example, the detection and monitoring of a plurality of different chemical species within an environment. Regarding claims 17 and 18, Snow et al. teach that the sensitivity of the apparatus can be manipulated by varying, for example, the ligand component or metal core size and type, etc. Snow et al. teach that the conductive modified particles for each sensor can be different from each other (see col. 3, lines 40 – 61). Regarding claim 17, if each sensor comprises varied elements (e.g., ligand component, metal core size or type, ligand shell size or type), it would logically follow that each sensor would inherently have a different response for the same analyte with a detector that is operatively associated with each sensor (see MPEP §

2112, 2144.02 & 2144.03). Regarding claims 19 – 21, Snow et al. teach all of the structure recited in the claimed method, which merely recites the conventional operation of that structure. Snow et al. teach that the sensing apparatus measures a time response indicating a variation in resistivity upon exposure to various sample vapors (see figures 5 – 8). Therefore, it would have been obvious to a person of ordinary skill in the art to perform the method recited in the instant claims upon the apparatus of Snow et al., as such is the intended operation of that apparatus.

3. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maley et al. in view of Dai et al. (U.S. Pat. No. 6,528,020 B1). Maley et al. do not specifically teach the incorporation of carbon nanotubes for sensing. Dai et al. do teach the use of carbon nanotubes in a biological sensor, wherein biological molecules, such as an enzyme, can be attached to the nanotube (see col. 5, lines 32 – 43). Dai et al. do recognize that there is a need in the art for sensing devices that provide not only significant and robust, but more advantageously, tunable response to a variety of chemical and biological species (see col. 1, lines 24 – 65). In addition, both of the disclosures of Dai et al. and Maley et al. are directed to sensing devices for detecting glucose (see Dai et al., col. 6, lines 1 – 6 & Maley et al., col. 1, lines 1 – 13). Consequently, a person of ordinary skill in the art would have recognized the suitability of incorporating the teachings of Dai et al. with the sensing apparatus of Maley et al. for the intended purpose of facilitating the effective sensing operation of a biological sensor (see MPEP § 2144.07). Furthermore, the Courts have held that the prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (see MPEP § 2143.02). As evidenced by Dai et al., carbon nanotubes can be effectively utilized in a biological sensor, wherein the

carbon nanotubes have organic or biological molecules, such as an enzyme, attached to the nanotube (see col. 5, lines 32 – 67 & col. 6, lines 1 – 17). Hence, a person of ordinary skill in the art would accordingly have had a reasonable expectation of success in employing the teachings of Dai et al. regarding the use of carbon nanotubes with a biological sensing device, as taught by Maley et al. Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate the use of a carbon nanotube, as taught by Dai et al., with the sensing apparatus, as taught by Maley et al., in order to facilitate effective detection. Regarding claim 7, Dai et al. teach that the nanotubes may contain silicon and that the nanotubes may be semiconducting (see col. 4, lines 11 – 65).

4. Claims 22 – 24, 27 – 29 and 31 – 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis et al. (U.S Pat. No. 5,571,401) in view of Dai et al. (U.S. Pat. No. 6,528,020 B1). Regarding claims 22 – 24, 27 and 31, Lewis et al. teach a sensing apparatus comprising: a first and second sensor electrically connected to an electrical measuring apparatus, wherein the first sensor comprises a region of nonconducting organic polymer material and a region comprising conductive particles, such as carbonaceous materials (e.g., carbon blacks, graphite, etc.); and an electrical path through the regions of nonconducting material and conductive particles (see col. 3, lines 36 – 67 & col. 4, lines 1 – 65). Lewis et al. do not specifically teach that the conductive modified particles comprise conductive particles having at least one organic group attached to the particles. Dai et al. do teach the use of carbon nanotubes in chemical sensors. Dai et al. do recognize that there is a need in the art for sensing devices that provide not only significant and robust, but more advantageously, tunable response to a variety of chemical and biological species (see col. 1, lines 24 – 65). Dai et al. further teach that

the nanotubes can be physically or chemically modified, so as to be tailored for a particular sensing application. Dai et al. teach that sensing agents can be deposited onto the nanotubes so that sensitivity to a wide range of chemical species can be achieved (see col. 4, line 66 – col. 5, line 6). The Courts have held that the selection of a known material based upon its suitability for the intended use is within the ambit of one of ordinary skill in the art. See *In re Leshin*, 125 USPQ 416 (CCPA 1960) (see MPEP § 2144.07). Furthermore, the Courts have held that the prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (see MPEP § 2143.02). As evidenced by Dai et al., organic polymers can be attached or deposited onto the nanotubes and thereby serve as effective sensing agents (see col. 6, lines 1 – 16). Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate the teachings of Dai et al. with the sensing apparatus of Lewis et al. in order, for example, to provide an effective tunable response to a variety of chemical and biological species. Regarding claim 28, Dai et al. teach that the nanotubes may contain silicon and that the nanotubes may be semiconducting (see col. 4, lines 11 – 65). Regarding claim 29, Dai et al. teach that that carbon nanotubes may be coated with metal particles (see col. 2, lines 28 – 32). Regarding claim 32, it is well known in the art that carbon black is a pigment material (see MPEP § 2144.03). Regarding claims 33, 34, 36 and 37, Dai et al. teach the incorporation of various polymers, such as polymethylmethacrylate, or biomolecules, such as an enzyme (see col. 5, lines 43 – 50 & col. 6, lines 1 – 11). Regarding claim 35, Dai et al. teach the incorporation of a thiol functional group (see col. 5, lines 33 – 63). Regarding claims 38 – 40, as discussed above, Lewis et al. in view of Dai et al. teach all of the structure recited in the claimed method,

which merely recites the conventional operation of that structure. Therefore, it would have been obvious to a person of ordinary skill in the art to perform the method recited in the instant claims upon the apparatus of Lewis et al. in view of Dai et al., as such is the intended operation of that apparatus.

5. Claims 25, 26 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis et al. in view of Dai et al., as applied to claims 22 – 24 and 27 – 29 above, and further in view of Foulger et al. (U.S. Pat. No. 6,315,956 B1). Regarding claim 25, Lewis et al. do teach the incorporation of carbon black, as a particulate conductive or conductive filler material, within the matrix of nonconductive organic polymer material comprising the sensing material (see col. 3, line 40 – col. 4, line 34). However, Neither Lewis et al. nor Dai et al. specifically teach that the conductive particles comprise carbon black having attached at least one organic group. Foulger et al. do teach the use of conductive filler materials comprising, *inter alia*, carbon black and carbon nanotubes, within an electrochemical sensor, in which the sensitivity and dynamic range of the electrochemical sensor is highly dependent on the conductive filler material. Foulger et al. teach that the conductive filler material may be any suitable material exhibiting conductivity and should have a structure which results in an inherently high conductivity with an affinity to develop a strong network (see col. 10, lines 10 – 67). Therefore, a person of ordinary skill in the art would have recognized the functional equivalence of carbon black and carbon nanotube materials, as a particulate conductive or filler material used in sensing applications (see MEP § 2144.06). The Courts have held that an express suggestion to substitute one equivalent component or process for another is not necessary to render such a substitution obvious. See *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). Therefore, it would have been obvious to

a person of ordinary skill in the art to substitute and incorporate the known equivalent carbon black material, as taught by Foulger et al., having an attached organic group, as taught by Dai et al., with the sensing apparatus of Lewis et al. in order, for example, to provide for effective sensing operation. Regarding claim 26, it is well known in the art that carbon black is a pigment material (see MPEP § 2144.03). Regarding claim 30, Dai et al. that the carbon nanotubes may be coated with metal particles, which impart sensitivity to a particular chemical species (see col. 2, lines 28 – 32). In view of the discussion above with respect to the recognized functional equivalence among carbon black and carbon nanotube materials as is generally known in the art, it would have been obvious to a person of ordinary skill in the art to incorporate conductive particles comprising at least partially coated carbon black materials within the sensing apparatus in order to provide for optimal sensor operation for a particular sensing application.

Response to Arguments

The final rejection is withdrawn. Prosecution is reopened.

Applicant's arguments with respect to claims 1 – 40 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian J. Sines, Ph.D. whose telephone number is (571) 272-1263. The examiner can normally be reached on Monday - Friday (11:30 AM - 8 PM EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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